16.0 Return on Investment of Safety Management

Jose. A. Blanco, Ph.D., P.Eng.
Health, Safety and Productivity Group
Laurentian University,
Sudbury, Ontario

MANAGING FOR SAFETY AND PROFIT
REPORT ON A THIRTY YEAR LEARNING JOURNEY

Prepared for: HUMAN FACTORS IN AVIATION MAINTENANCE SYMPOSIUM, VANCOUVER, MARCH 2000

INTRODUCTION (SLIDE 1)

My purpose is to share with you my position on managing for safety and profit, or the ROI of safety management.

Let me begin by stating my position in the following way **(SLIDE 2)**:

In a competitive market,

Without sustained profit (or benefit), the organization has no future.

Profit (or benefit) can not be sustained without efficiency,

Efficiency can not be sustained without safety.

Safety is therefore a core management issue.

Inefficiencies, or other words such as failures, losses, accidents, incidents and injuries are all used to describe events that have two common features: they are **unplanned**, and they **disrupt the flow of revenues but allow the expenses to continue**. At their least, they are a lost opportunity to increase the ROI - money or other benefits-, and at worst, a real decrease in ROI. Conversely, having fewer unplanned events and reducing their impact would benefit the ROI and improve the organization's competitive position and its future prospects. Of course, reducing the number and effect of unplanned events may create costs, but that is not quite as obvious as it seems at first sight, because **removing unplanned events liberates capital and operating resources** that can be used productively. For example, organizations involved in "lean" operations had to develop the concept of **"found capacity"** to describe their new-found ability to respond to customer demands with lower inventories and higher reliability and efficiency (1), and, consequently, significantly lower costs.

The key economic question for the manager is whether the **net present value** of the increase in benefits from having fewer unplanned events is greater than the net present value of the increase in costs required for implementing their prevention. But benefits and costs have to be considered **across the organization** and **along time** to avoid jeopardizing the organization's future. These are difficult questions because the conventional acounting practices available to the manager usually have a very narrow organization and time focus, although this is starting to change.

My position on safety as a key to efficiency started to develop with my experience as plant superintendent in non-union settings, in two continents and two languages. It grew with the experience of introducing major productivity and safety gains as the operator first and the manager later of a large unionized smelter in Canada. The tools of "quality", "just in time", "ISO's", "lean manufacturing" etc. and computers would have made that task easier, but not very different.

We made improvements by successively applying systems and using maintenance, skill development, or technological improvement as platforms. Like most everybody else in these times, we also resorted to management by fiat. They all worked for a while, but the rate of progress could not be sustained and progress plateaued.
A chance encounter in the middle of one of those plateaux **identified safety as a platform that could lead to sustainable progress**: safe production, or efficient safety, or whatever. We tried it, and it worked.

I later had the opportunity, as a Division VP, to work with the linkages between corporate and divisional strategies. I had experienced the difficulty of getting ideas and objectives across hierarchical boundaries, with or without unions, but I was astonished at how the **interpretation of even simple corporate messages varied as the management context shifted across boundaries**. And this despite the fact that the different parties used essentially the same words and seemed to be in agreement. This confirmed my observation that what was needed was an almost sensory interpretation for the key words, **a way to link them to the organization's context, to its reality,** before they could be adopted and used properly. It was then that I realized that **safety could provide the link to the organization's context at the divisional level as it had done at the managerial one.** I saw safety as one aspect of efficiency that had the power to reach deep into the organization, and I was hooked. I have continued reading and working on efficient safety, quality tools, managerial intent, and alignment of strategies and tactics ever since.

Here are some questions to ponder as we move a little further into the relationship between ROI and safety management. Assume the context is a shop -any size, internal or external- that provides maintenance services to the aviation industry. **(SLIDE 3)**

Can an unsafe airline maintenance shop deliver safe aircraft?

Can a safe airline depend on an unsafe maintenance shop?

Can a maintenance shop be efficient if it is unsafe?

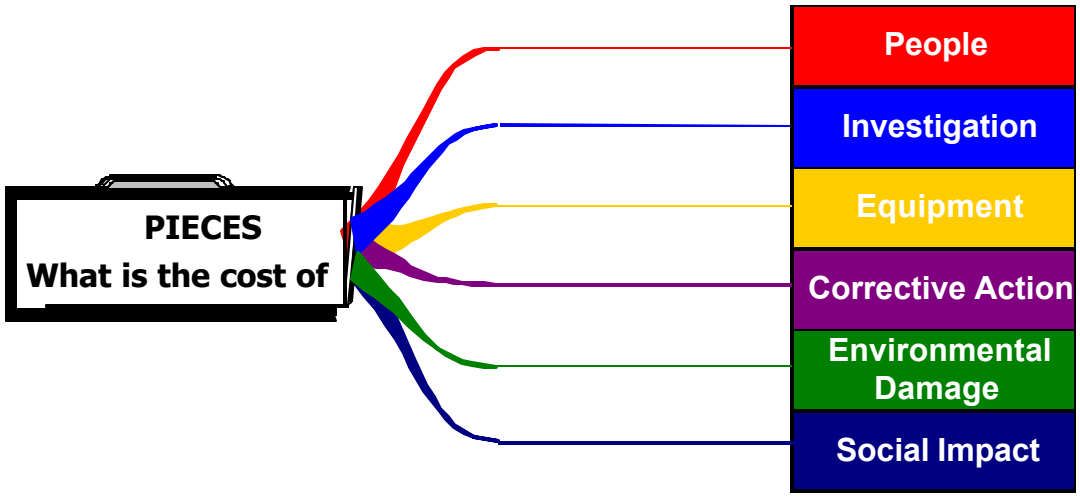
Or, if you prefer:

Can a maintenance shop be safe if it is inefficient?

Could a shop choose to be safe by being inefficient?

Let us take a closer look at safety at the shop level. **Injuries reveal latent inefficiencies** that are not controlled or managed. Like all unplanned events, they crimp the revenues but add expenses. But unlike other unplanned events, **injuries become visible, they affect people, and they reveal other unplanned events,** such as lost capability, lower product quantity and/or quality, loss of resources and skills, and even more damaging, a possible loss of trust.

Some of the events revealed by the injuries could also have **repercussions in remote places as well as forward into time: on the workforce, the organization, the client, the shareholder,** ultimately even on the business environment for the organization. That is why safety management systems can bring other benefits well beyond improved safety. Here is an example of the type of losses that have to be taken into account for evaluating unplanned incidents. **SLIDE (4)**.

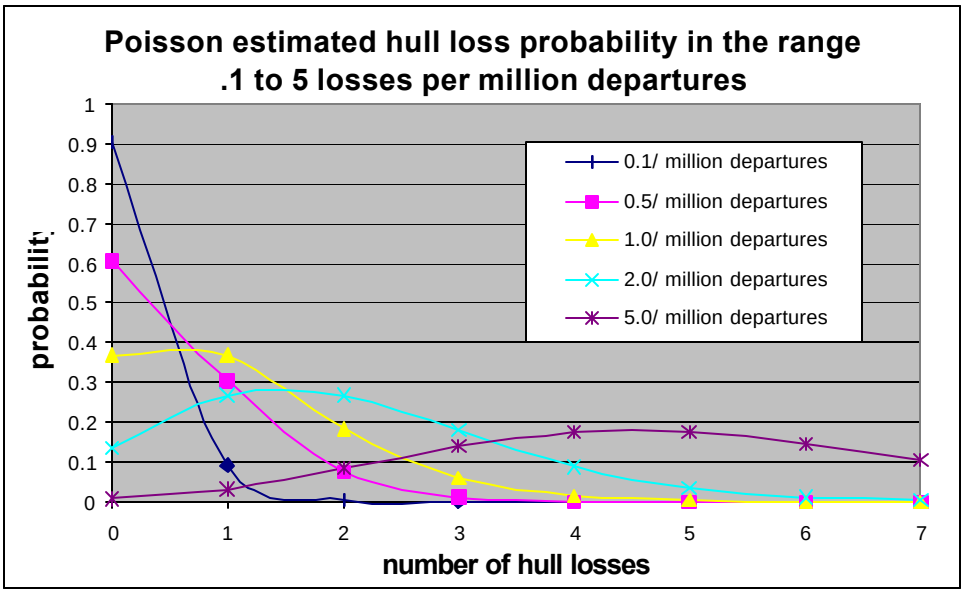


The implications for the shop manager may be more or less obvious, but they are large.

Now let me shift the scale of my argument.

Safety in the Aviation Industry
Yesterday, Art LaFlamme (Director General, Civil Aviation, Transport Canada) and Don Sherritt (Director, Aircraft Maintenance and Manufacturing, Transport Canada) spoke about the challenge the airline industry faces: the need to drop the number of hull losses per million departures at least as fast as the number of flights increases, just to keep hull losses per year constant. A growing number of air crashes would trigger a public -and therefore a regulator- reaction against the industry. Leaving things as they are today would not do because airliner crashes would double - or worse- as the number of flights doubles.

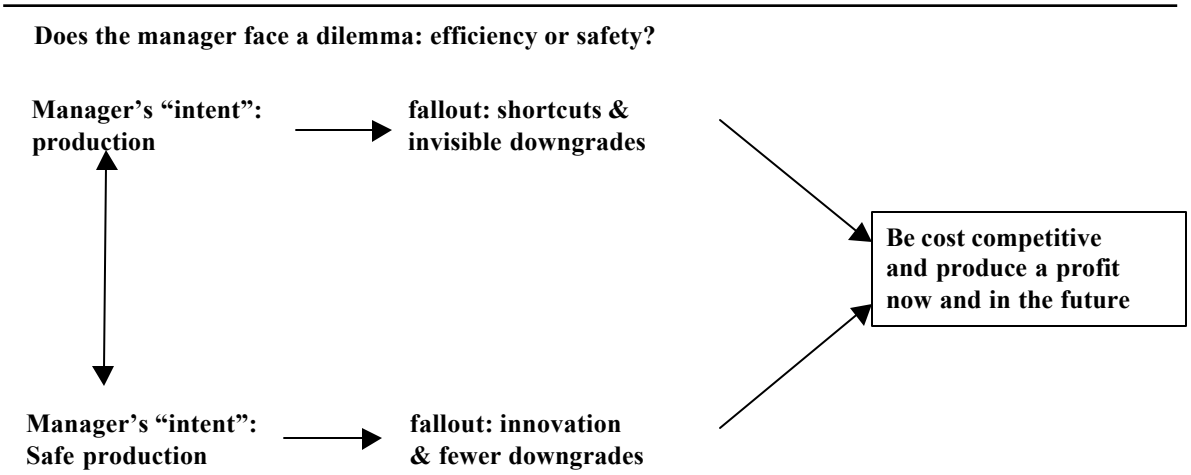
The actual experience of North American airline groupings in the last 10 years ranges from .5 to 1.5 hull losses per million departures (2), and a number of airlines had no fatalities in that period. The Poisson distribution, initially developed as a statistical model to interpret occurrences of low probability events in situations that involve large number of trials, is well suited to the hull loss problem in the airline industry. The Poisson (3) distribution tells us **(SLIDE 5)** that airlines within groupings that have been operating at rates of .5 **and continue to do so** are much **more likely to have no losses than to lose one or more hulls per million departures**. On the other hand, airlines that continue to operate in the 1 or 1.5 rate are **more likely to have one or more losses per million departures than to have none.** The Poisson distribution also estimates that airlines that



continue operating under conditions that delivered loss rates of .1 (one hull loss in 10 million departures) are 130 times more likely to have no losses than airlines that continue operating under conditions that delivered a rate 50 times greater (one loss in 200,000 departures). Or course, the Poisson distribution is just a model, but it provides a heads-up. From an industry point of view, the Poisson probability distributions of **(SLIDE 5)** confirm that most of the gains would be in helping the airlines operating at averages of 5 to drop to 1.5, those at 1.5 to drop to 1, and those at 1 to drop to .5, all the while encouraging those that are already between .5 and zero to sustain their performance. It **does not tell us how to do it, or how difficult it might be.**

Any drive towards improving the hull losses per million departures will bring forth the argument **that safety improvements can only come at the expense of efficiency,** but this argument is superficial. I mentioned earlier how a concept of "found capacity" was required to explain increased revenues and lower costs arising from lower inventories and higher reliability and efficiency (1). We intuitively accept that the intrinsic safety and efficiency of different technologies can be different, and therefore expect that similar technologies should achieve similar safety and efficiency. However, based on the evidence of the last hundred years, we know that **different ways of managing similar technologies can produce very different results**. This is after all one of the reasons why companies change presidents, or managers; it is also my experience as we will discuss later.

So, **how do the airline managers get the safety improvements** the industry needs? I would suggest that they could start by acting on the position that they **do not have to choose between safety and efficiency** and follow up by setting **prevention programs that involve employees at all levels**. **SLIDE (6)** paints the perceived dilemma in simple terms.



The issue for the managers is to choose the **default position** most likely to lead to profit now and in the future. Supervisors and workers (and suppliers and sub-contractors) will know whether the organization favours production or safety as the default position. They will think and act accordingly, and the results they achieve will reflect their interpretation of the organization's default choice.

From my point of view, the case for efficient safety (or safe efficiency?) is strong: in a competitive market, running a safe technology mix under safe production management systems can be profitable, **whereas running the same mix without regard for safety will limit the potential for profit**. This happens because there is no boundary separating efficiency from safety in people's minds. **Bad practices, whether unsafe or inefficient, are highly contagious; one thing leads to another, and the end point can not be predicted**. Humans act as carriers of bad practices, and **management will not be able to isolate bad practices within designated pockets inside the organization.**

Even more; I believe that we are entering a period of highly competitive and open markets in which **safety will become a key marketing and efficiency differentiator** between organizations that provide ostensibly comparable services. I would imagine that airline companies that aim to operate at the .1 hull losses per million departures will restrict their alliance partners to companies with similar safety performance objectives and would be reluctant to form partnerships with organizations that favour operating practices that might keep them in the 2 to 5 range. Think again about the questions raised in **SLIDE (3).**

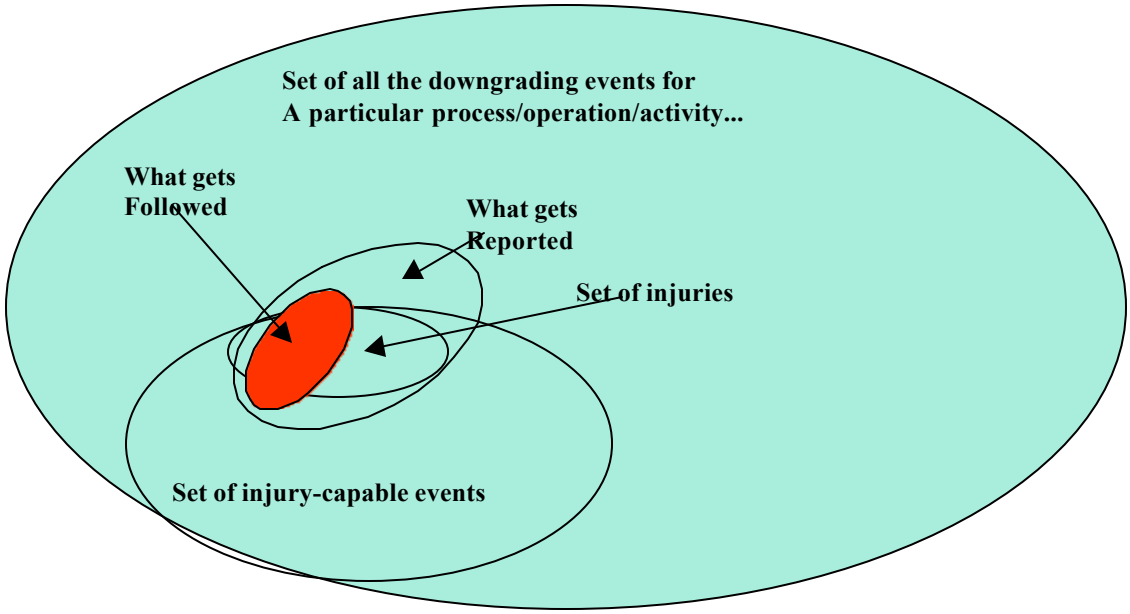
Back to my learning about safe efficiency (efficient safety?). The experience that I am talking about covers over ten years in a large operation in one large site. To give you an idea of **size**, there were at one time over four hundred trades people -electrical, instrumentation, carpenters, masons, mechanics- and about seventy-five technicians and engineers supporting over one thousand production people. The plants operated around the clock.

I want to deal with two issues before continuing: is heavy industry experience relevant to the civil aviation industry? and is there a link between hull loss and operating or shop safety?

Yesterday we heard about Three Mile Island: obviously industrial experience applies to the aviation industry and vice-versa. Never mind differences in technology, complexity and experience. Safety and efficiency are tied to human and organizational factors in all industries in the same way. The **tools to collect data, to interpret the data into meaningful information, and to convert that information into usable knowledge are similar. The management systems required to sustain safe and efficient production are similar. The barriers to communication are similar, and so are the internal power and authority conflicts**. It should not be a surprise: all organizations have humans in common, and these are human issues.

This human contribution also explains why there is a strong link between the potential for hull loss and operating or maintenance safety. **Bad practices are highly contagious and can last a long time**. We have watched how attempts to establish and maintain good practices in a sector repeatedly fail when bad practices are tolerated elsewhere in that same organization. Imagine a flight crew that consistently have to deal with inadequate repairs, or a maintenance crew that has to repair repeated damage they think results from carelessness, or flying or maintenance crews that are forced to use inadequate tools or parts, or have to take shortcuts they think are inappropriate. Consider the further complication of management awareness and action raised in **SLIDE (7);** what **we know can be a little portion of what happens**, and what that little portion is and how small is determined by the interest that we show and the questions that we ask, our "default" position. Consider how a willingness to accept substandard parts or workmanship might affect the interest that we show, the questions that we ask, and the answers that we get. I will come back to that.

Leveraging the interaction between safety and productivity: more happens than is reported, more is reported than is followed up.



The limits to progress
Let me re-state my views on the subjects of safety and efficiency in industrial settings: **SLIDE (8).**

In a competitive market,

No profit (or benefit), no future.

No efficiency, no profit (or benefit),

No safety, no efficiency.

"therefore, in a competitive market, safety is a core management issue" as I return to my story.
After I had been a manager for several years, having made large efficiency gains and having reached a ceiling in safety improvements, we were wondering about future progress. After some discussion following a plant visit, a visitor asked me:
"have you ever thought that the safety performance in your plants can not improve because you are happy to accept things the way they are?"

I though the question was inappropriate because the reasons for injury were quite clear: **SLIDE (9)**

The prevailing interpretation: some examples

Molten metal and process burns: the nature of the process

Back injury- electricians and instrument technicians: testy, strong unionists

Back injury to heavy duty mechanic repair: in a hurry to get out, impatient

A steady stream of injuries. We said to one another, (with pride?):
" Not a cookie factory" . We expected injuries.

And on, and on. The organizational impediments to greater involvement were equally clear: too many, a distraction from more important issues, too costly…**SLIDE (10)**

Impediments

Too many to investigate
Too expensive to follow up.
A distraction away from important supervisory activities, a nuisance.
Could not tie up the supervisor or myself to just this one aspect of the operation.
Too many other operating surprises that required attention.
The work force was ageing, a hotbed of strong unionists, definitely not pro-management.
A number of employees resented their seniority-forced assignment.

And yet… I found the question very unsettling. My visitor implied that I was setting the limits to progress: could it be?
So we dug up lost time injury records, one by one, for employees working in our plant who had worked for our company for 14 years or more. We arbitrarily decided that 14 years would be enough to tell the story, and we only counted injuries that led to time loss because other injury data were less reliable. The data are shown in **SLIDE (11)**

FOURTEEN YEAR INJURY HISTORY OF 808 WORKERS

injuries per worker in 14 year history	total injuries over the 14 years	# of workers in sub-group	predicted for case of equal chance
6	6	1	0
5	60	12	1
4	68	17	6
3	129	43	32
2	188	94	118
1	205	205	291
0	0	436	359
average per worker	total injuries	total workers	
0.812	656	808	

First reaction: thirty people accounted for 134 injuries!
It had to be their fault; accident-prone people, surely. But then- why hadn't I been aware that there were so many injuries in such a small group? Was that to be expected? Was there anything unusual? I had to find out by talking to the thirty employees and their supervisors.
When I talked to these thirty employees, they seemed surprised and upset- **weren't they aware that their accident record was unusual? And, why hadn't their superintendent known about that situation?**
Their general foreman surely must have known, and their foreman…But they did not know either.
And the union was upset that we were putting pressure on the employees, but we thought they were just finding excuses for accident-prone union members. So we ignored them.
Then…it dawned on us that a good number of those in the multiple-injury group were masons, maintenance mechanics, electricians, or instrument technicians. Maintenance people. Some of them **we knew as very competent and dependable workers**. Why were so many good employees on the list of people with multiple injuries? Had they been exposed to greater risks than other maintenance people or other workers in general? Had we, unknowingly, actually set them up for a fall?

A second look at the same injury data.
And what did we know about their injuries?
As it turns out, not much. We did not think that we were insensitive, but the fact is we had not seen the patterns, the recurrence, and the consistency. We had been in the habit of interpreting injuries as isolated incidents as if they were unrelated to one another, but apparently we were wrong. The **data did not support the assumption that the plants merely threw off injuries at random**; instead, it showed groupings that turned out to be statistically significant. **The data did, however, support the assumption that we (starting with me, the manager) had been tolerating (encouraging?) hazardous and wasteful practices**. I had some trouble getting over that harsh revelation.

Seeking injury groupings and patterns (such as statistically significant multiple injuries to the same employee, or within a particular group, or doing some task, or using the same equipment, or in the same site, or shift, etc.) instead of interpreting each injury as an isolated, random, incident, gave us a very different perspective of reality. We began to see new patterns and to reach new conclusions. More importantly, we began to find ways to prevent accidents or mitigate their effects.

Same injuries in a different light
We started to see these injuries **SLIDE (12)** as a telltale of underlying efficiency problems.

The new experience:

Molten metal and process burns because of spills, mismatched capacities and inadequate repairs

Back injury rolling cable spools over uneven terrain

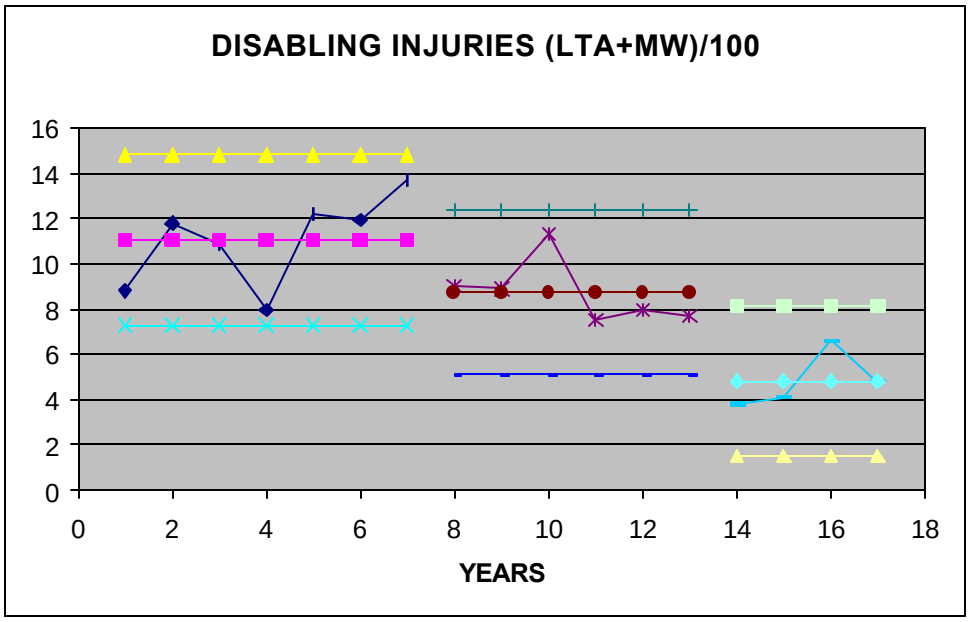
Back injury while heaving to tighten large nut in very close and hazardous confined areas using a three-person team equipped with jerry-rigged 6 foot wrench

Assorted injuries while rushing to repair key equipment that routinely failed prematurely

Slips and falls at exits and entrances to process buildings, especially during freezing season

We realized that these were management problems because they could only be resolved or mitigated by some level of management, and we set up and implemented safety management systems. And as we started asking ourselves, and others**, more questions, we snagged out unplanned events that would normally have been ignored**. This led us first to expand from injury reporting to **incident reporting and then to adopt incident reporting as the basis for an effective management tool to conquer variability and increase efficiency**. I think this is the **equivalent of what Maurino**

suggested and B.F. Goodrich, Air Nova and Air Canada described yesterday as "error reducing programs".
Although the path was not painless or straightforward, the new perspective allowed us to act, and the results were striking. The time series in **SLIDE (13)** covers about eighteen years broken into three periods; it shows the averages and the natural upper and lower control limits (4,5). The first seven years are given as background; I joined this group about year 8. The next six years show some safety improvements; the visitor asked his question about year 13, and the following four years show the results of the new approach to safety and the new safety management systems.



The safety management systems we set up at the time have survived and have delivered additional improvements for another ten years. **Workers compensation rates dropped in half**. As for the safety-efficiency ROI, it is difficult to calculate, but it was huge because we released **much "found capacity".** Operating and capital budgets were still lower six or seven years into the program despite significant inflation. **The safety and incident management systems paid in spades.**

New perspectives.
To understand the old data and try to wrestle new information out of it we had to devise ways to show ourselves and others what was or was not going on, pictures, graphs, certainly not just words or numbers. Eventually we learnt about the Poisson distribution (3), time series and natural process limits (4), and u-charts and upper and lower control limits (5).
We realized that many of the 656 lost time accidents in the previous 14 years could have been prevented, and that their earlier prevention would also have removed inefficient process steps earlier on. It was obvious that we in management could have made that choice but we had not because **we could not see the problem, therefore we had not understood either the problem or the opportunity. No only that, but we weren't even**

aware of much that was going badly and could have been fixed. We certainly weren't aware that we were a major part of the problem.
It was only after deep reflection that we started to understand how the organization could remove self-imposed limits to safety and efficiency. We started to notice that un-safety was contagious, that it travelled within the organization and beyond, and that **at each successive level the default position of the group's manager ("the manager's intent") set the ceiling to results**. Incidentally, it was a Transport Canada Aviation Safety Letter in the late eighties that commented that airline management's intent travelled with pilots and crews and influenced their actions, and thus the results they achieved. Commander's intent, or **"auftragstaktik"**, from the battlefield to the airliner's cockpit, from there to heavy industry and now back to aviation. So, for Transport Canada, this is what you get for writing challenging stuff.
Mauriño et al. have much the same to say on the subject of aviation safety and effectiveness (6):
"no matter how much humans excel in their individual or small team's performance, they can never be better than the system which bounds them".

When I add this statement to my earlier one on safety as a core management issue **SLIDE (14),**
"In a competitive market, profit can not be sustained without efficiency, and efficiency can not be sustained without safety. Safety is a core management issue" ,
I conclude that:

"Safety is bound by the system (organization) and that is why it can not be understood if it is interpreted as an isolated event or a conventional cost issue; safety can only be understood as the organizational and ROI-related issue that it is".

Let us return to aviation. **(SLIDE 15)**

No-one in any organization should wait for catastrophes to hit before they learn how to avoid them or mitigate their impact.
Prevention is a more prudent choice. Incident prevention programs provide effective countermeasures to failure because:

•Some human, organizational and managerial failure factors can be identified and corrected before a failure happens, and

•The process of preventing failures strengthens the organization's resilience and improves its ability to anticipate and correct failure factors and prevent failures.

•Failures are inefficiencies, and inefficiencies are waste; fewer failures lead to greater efficiencies.

A policy of prevention

Some who choose waiting may be spared by chance or by timing, but their organizations may be paying a heavy price as they absorb failure after failure as they drift towards their inevitable losses. Prevention is the more prudent strategy. A policy of prevention may lead to improved efficiency, because it provides countermeasures to failures and therefore reduces waste. Prevention can lift self-imposed limits, free resources for results that the customer will pay for, and produce benefits such as good will and a positive business environment. These are the type of reasons that support the success of six-sigma, just-in-time, theory of constraints and other modern management systems designed to conquer variability and achieve efficiency. (7,8,9,10).

Preventing failures meets the conditions for progress that Jim Reason gave us with his swiss-cheese picture:

- Some human, organizational and managerial failure factors can be identified and corrected before a failure happens (plugging some of the holes in the swiss cheese),
- The process of identifying and correcting failure factors strengthens the **organization's resilience** to failures (repositioning cheese slices so some of the holes are not aligned),
- The resulting increased awareness increases the organization's ability to **anticipate failures and mitigate their effects** (adding a "coping" slice of cheese with no holes).

And all along, injury prevention leads to failure prevention which leads to efficiency gains. So, instead of waiting for catastrophes, it is more prudent and more profitable to engage the employees into reducing the number and severity of workplace injuries.

SLIDE (16)

Injury prevention programs feed directly into failure prevention programs

•Injuries are visible

•Injury prevention has broad appeal

•Safe work and safe products benefit employees and customers

Failure prevention programs naturally feed into efficiency improvement:

•Recurring injuries as process diagnostic

•Knowing the sources of variability invites innovation

•Prevention programs are visible and remove fear of change

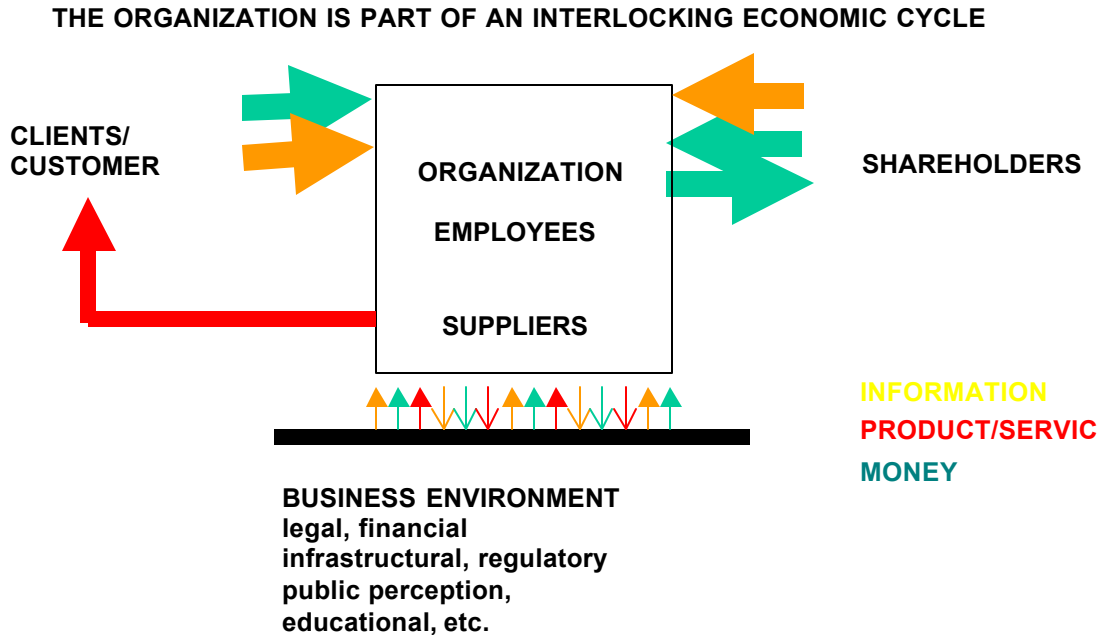
Such programs are learning and teaching programs

Injury prevention programs spill naturally into failure prevention programs because injuries provide visibility into other failures. Prevention programs can have a broad appeal because the results benefit the organization, the employees and the customers. **Prevention programs also avoid the corrosion of trust and respect for management that comes with seeming to favour production over safety; prevention programs prevent Reason's mouse chewing holes in the coping barrier.**

Failure prevention programs feed directly into efficiency improvement programs because of the diagnostic value of recurring events. Injuries recur where the process is most unstable or hardest to control, or the equipment is inadequate, or where the protective barriers are weakest, or the procedures or tools inadequate, all of them sources of process variability and inefficiency.
Failure prevention programs are **field action programs; they invite innovation** as they define the sources of variability that need fixing, and they make the **innovation easier to implement** because they remove the fear of change.

In our experience, the programs that we set to track and remove the human, technical and organizational sources of injuries helped us **track and remove process variability sources such as premature equipment and process failures, delays, off-spec products or services, recirculation, spills and contamination, excess capacity, lack of standardization, inadequate skills, or plain surprises. I would expect parallel results in your industry too, although the specifics may be different.**
These programs **are teaching and learning programs** that work because they acknowledge that humans **are** a constant source of errors, but they **can be** a barrier against loss. They **raise awareness and expectations** in employees and management alike. The results: more eyes to see and more hands to help instead of more eyes closed and more hands waiting.

The dynamics of the organization
Now that we have dealt with the issues of safe-efficiency or efficient-safety in the managerial area or shop, we are ready to look at how the dynamics of the organization impact on the shop or managerial area or service provider. To be an effective contributor to the organization, the manager needs to speak and understand the organization's language and key preoccupations.
Basically,to survive, the organization needs to adapt to the political/technological/economic/financial forces that act on its environment; it responds appropriately to changes in that environment - or it dies. **SLIDE (17)**

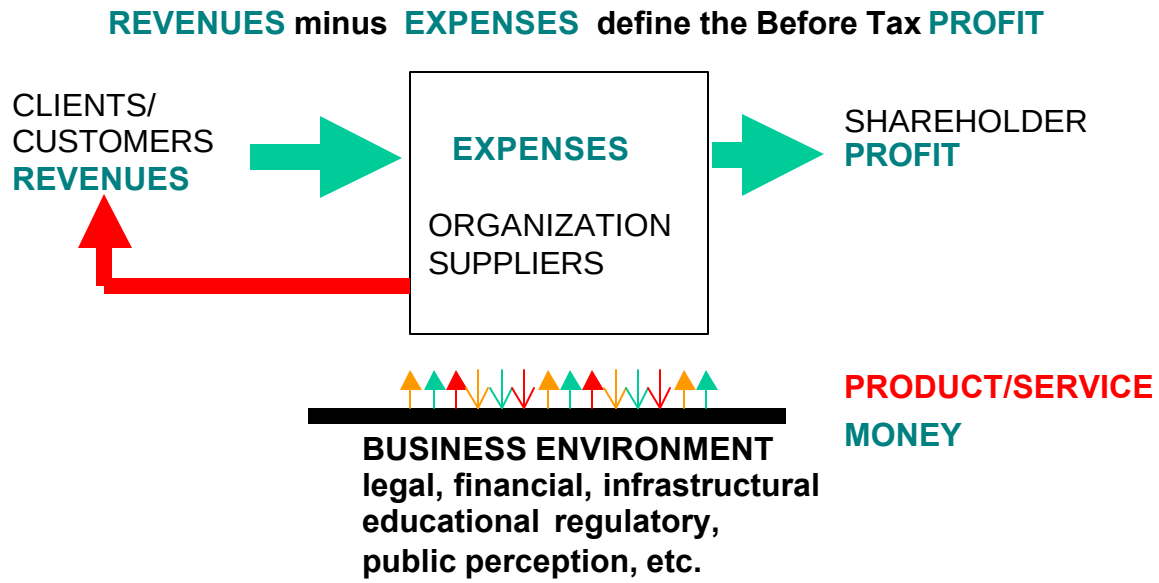


These forces act on the organization at all times and impose some conditions for its survival, what I call the "business survival theorems" of **SLIDE (18).** Easy to remember.

Six "business theorems" of the organization

- **Adverse business environment, no business**
- **No customer, no business**
- **No finances, no business**
- **No profit (or benefit), no business**
- **Narrow focus on the present, no future**
- **Narrow focus on the future, no future**

The organization's economic survival -protecting its business environment, having a customer and sustaining a reasonable ROI over time, that is, sustaining revenues greater than expenses- is what ultimately brings safety, efficiency (or effectiveness, or productivity) and ROI together. **SLIDE (19)**



The main source of revenues is the money that the customers pay for the services or products that they get from the organization. The organization uses part of that money to purchase the production capability plus the services, supplies or raw materials that it needs to make the quality and quantity of product or service that the customer will pay for. Given a customer and the right environment, the organization's economic survival

depends on how well it uses that capability and resources. In the "theorem" format, **SLIDE (20)**

One "operating theorem" of the organization

Total productive capability = useful capability + waste

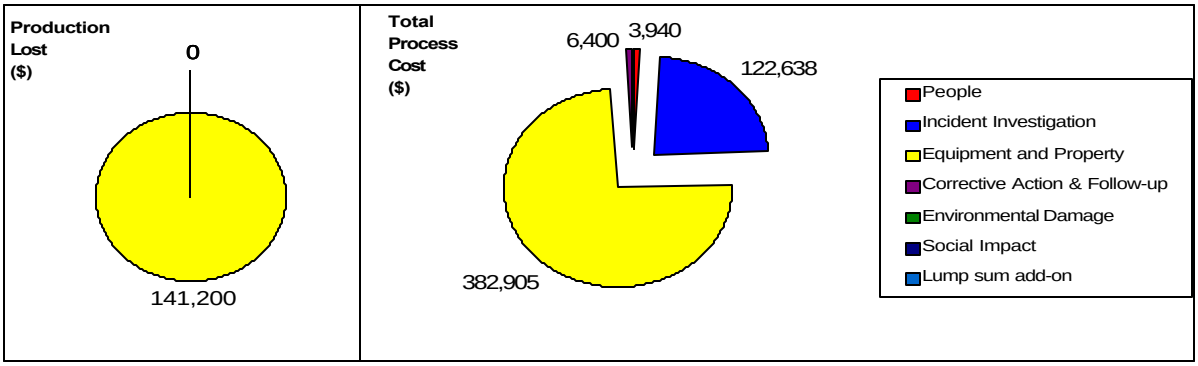
Where waste is all productive capability or activity that:
- **Damages the business environment**
- **Is not paid for by some customer**
- **Instantly or over time costs more than it brings in**

Remember the **"found capacity"** of the lean manufacturers? They "found" (implying essentially free!) that capacity by whittling down on unplanned events, failures etc. In this so-called theorem, we expand the concept **of "waste" beyond the local shop to include the organization and its environment**. Conventional cost systems are not likely to address the loss of economic opportunity (revenue and profit), the loss of productive capability that is wasted, or the effects of a deteriorating business environment, for example. Instead, the usually narrow focus on local costs keeps most of the relevant organizational questions out of focus. Let me give you a real **example of "lost capacity" and "waste" calculated using a Total Process Costing software application recently developed by my colleagues in Sudbury (11). SLIDE (21)**

Incident Costing - Summary Table

Incident costs are divided into following six cost-pools

Pool		Total Cost of the Incident	Revenue to recover the cost
1	People	$3,940	
2	Incident Investigation	$122,638	
3	Equipment and Property	$382,905	
4	Corrective Action & Follow-up	$6,400	
5	Environmental Damage		
6	Social Impact		
7	Lump sum add-on		
		$515,883	

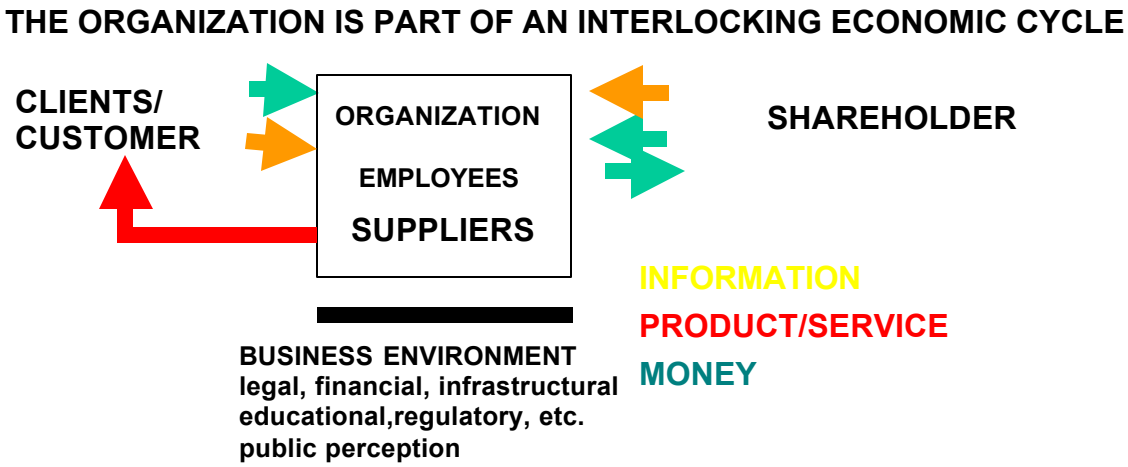


Having looked at the large picture and the intermediate one, **let us not forget the employee**. It is the employees' actions that ultimately affect customers and shareholders, and it is therefore essential that the organization's business goals are clear and acceptable to the employees ("alignment with the intent"). As customers, we can tell the difference between happy and disgruntled service providers or telephone operators. What we want as managers is to make sure that the overall level of performance rises as we remove our own self-imposed ceilings, and only the employees can do that.
It looks rather formidable, but it turns out to be quite simple **SLIDE (22)**

The organization prospers by harmonizing the needs of:

the public and its representatives,
Shareholders and financiers,
Customers,
Its own employees,
in the present and for the future,
And by matching its productive capability to these needs, and viceversa

All of the preceding means that we need a new **"language" of safety and efficiency that takes into account their ROI implications and manager's and employees' pivotal role in it**. I offer you five observations to advance the discussion. **SLIDE (23)**



FIRST OBSERVATION:

A shop or department contributes to the ROI with more revenues and less expenses, and protects the organization's business environment.
Locally as well as remotely in place and time.

You have to justify local expenses for remote benefits in the language of the beneficiary, often very different from the proponent's language.

This often means justifying making expenses locally for remote benefits and vice-versa, or pain now for gain later. It also means learning to explain the costs and benefits of a project in the language of those who will benefit, which is often very different from the language of those who make the proposal.

SECOND OBSERVATION:

The product/service capability not sold and paid for is lost revenues, and it is redundant to current sales.
The expenses pay for all the capability, whether used or wasted.

What remains idle or is misused is wasted.
You have to closely match total capability to what the customer pays for, or viceversa.

THIRD OBSERVATION:

Serious safety problems often recur around steps that risk falling out of control. These injuries reveal just a fraction of the hidden inefficiencies.

Use safety as a good diagnostic and efficiency tool. It is a very good teaching and learning tool.

Serious safety problems often recur around activities that require the operators to wrestle into submission a step that risks falling out of control. It could be due to poor light, tight quarters, no tools, wrong instructions, no instructions, bad schedules, premature equipment failures, etc. In any case, these represent wasted capability. The underlying problems recur, but not every opportunity produces an injury: in other words, these injuries represent just a fraction of the underlying inefficiencies.

Not only safety and productivity can not be mutually exclusive; for any mix of technologies and conditions, the greatest productivity, by definition, requires the safest operation. Safety can be a diagnostic tool for inefficiencies that will otherwise remain invisible.

FOURTH OBSERVATION:

Historical budgets usually include the costs of previous years' incidents/accidents and of the underlying inefficiencies.
The status-quo becomes the standard and makes prevention a variance

Implement a zero injury policy (not a number target!). All injuries are downgrading events that call for investigation, evaluation, cause removal and follow-up; this improves safety and, often, releases "wasted capacity".

The shop's annual budget (and therefore the organization's?) usually includes the costs of historical incidents/accidents. It seldom includes budgets for preventing losses local or remote in distance or time. Conventional budgeting entrenches the status-quo as the standard and turns prevention into an explainable variance. Surely enough, past performance is replicated. That is why safety problems recur. Historical budgets also shelter the underlying inefficiencies, and they recur, too.

We need to adopt a zero injury policy (not a numerical target) that recognizes all injuries as downgrading events that call for investigation, evaluation, cause removal and prevention; these actions promote improving safety performance and releasing "paid for" capability for additional revenue or for removal.

FIFTH OBSERVATION:

Without change, the safety performance of the past will be repeated, it gets entrenched, it becomes the norm.
If the unplanned events that produce injury continue unchanged, the unplanned events that create a loss likely will too.

You have to make changes to get different results

If the injury-producing unplanned events continue at past rates, the loss-producing unplanned events may also continue at past rates. The self-defined ceiling sets in.

Without change, the safety performance of the past will be, at best, repeated, it gets entrenched, and it becomes a base line to deteriorate from. Only management can change that.
Injuries and other unplanned events reveal underlying latent failure factors, and a sound analysis and prevention program can be a solid basis for improvement. It gives a glimpse of what we otherwise can not hope to know.

And to summarize this discussion, let us get back to the ROI-Safety theme of this presentation, **SLIDE (28)**

The ROI suffers from failures and the resulting wasted capacity (lower revenues and higher costs)

Safety management systems can lead to fewer injuries, fewer failures and greater resilience and anticipation

Fewer failures and an environment of greater resilience and anticipation are more likely to prevent the next catastrophe than the alternative

The ROI gains from the fewer failures and the resulting "found capacity" (Higher revenues, lower costs), and from the improved business environment

I have included a couple of statements taken from the Weyerhaeuser 1999 Annual Report to shareholders; their senior management state their default position, their intent, for themselves to achieve, and for their shareholders to judge and measure.

SAFETY (Weyehaeuser 1999 Annual Report)

"Why should our shareholders care about our safety performance? Because, statistically, good safety performance correlates closely with other performance indicators—such as productivity and quality—that bear directly on Weyerhaeuser's profitability. But, even more important, we know our investors don't want to see people get hurt any more than we do.

I'm pleased to say that all our safety indicators are greatly improved from just a few years ago—recordable incident rate, lost-time accidents and severity of injuries. For example, the number of injuries requiring more than 30 days away from work declined by 20 percent in the past year. And, for the first time ever, we experienced no employee fatality in North America within a calendar year!"

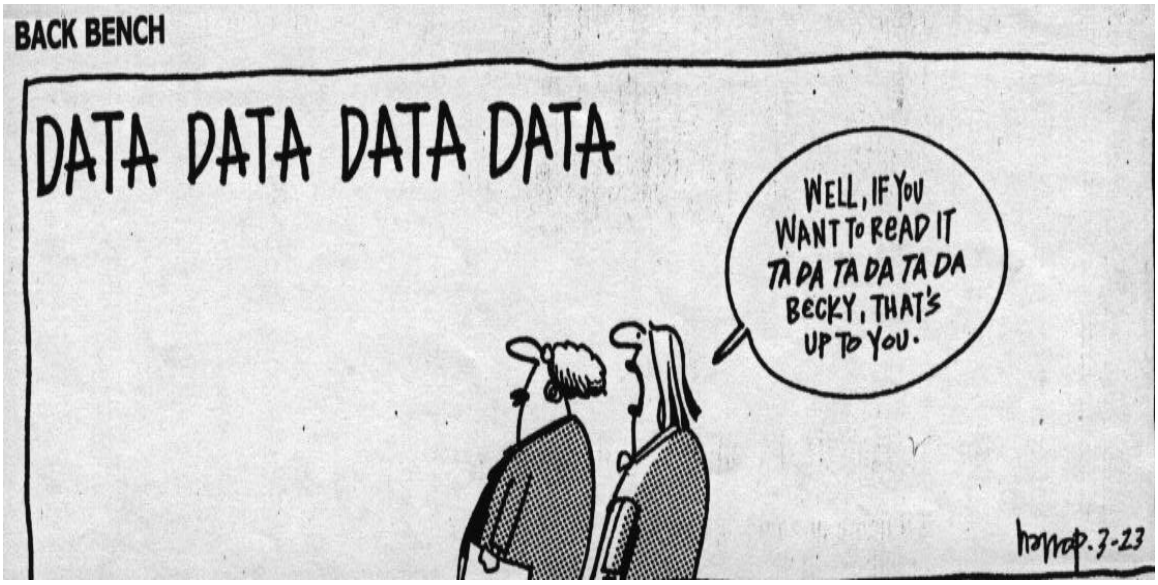
and…

OPERATE SAFE FROM THE START

"Safety is our number-one priority and critical to achieving our goal of becoming the best forest products company in the world. We believe that all incidents are preventable, that all employees are responsible and accountable for creating a safe and healthy workplace, and that all risk management is interrelated. Based on these principles, we're striving to create an accident-free workplace. . . .

. . . reduced our RIR by nearly 42 percent since 1995, but we know we can become even safer. We'll know we have a safe work environment when our RIR is less than one."

And last, a recent cartoon captures the true danger for all of us in management: to see **"ta-da"** where we should have seen **"data"**.



As the lady says, it is up to us.

REFERENCES

(1) Dauphinais, G. W., Means, W., & Price, C. (2000) Wisdom of the CEO. New York: John Wiley & Sons.
(2) Transport Canada (1999). Flight 2005: A civil aviation safety framework for Canada. Civil Aviation Publications
(3) Stevenson, W.J. (1989). Introduction to management science. Homewood, Illinois: Irwin.
(4) Wheeler, D.J. (1993). Understanding variation: The key to managing chaos. Knoxville, Tennessee: SPC Press.
(5) Swift, J.A. (1995). Introduction to modern statistical quality control and management. S Delray Beach, Florida: St. Lucie Press.
(6) Mauriño, D.E., Reason, J., Johnston, N., & Lee, R.B. (1955). Beyond aviation human factors. USA: Ashgate.
(7) Harry, M., & Shroeder, R. (2000). Six sigma. New York: Currency.
(8) Goldratt, E. (1990). Haystack syndrome. Croton-on Hudson, New York: North River Press.
(9) Dell, M. & Fredman, C. (1999). Direct from Dell: Strategies that revolutionized an industry. New York, New York: Harper Business.
(10) Skerkenbach, W.W.. (1987). The deming route to quality and productivity. Rockville, Maryland: Mercury Press.
(11) Blanco, H., Lewko, J., Djivré, J. & Koppinen, T. (May 1999) The Total Process Costing Tool: Putting the Pieces Together, Proceedings of the Mining and Health Safety Conference, Sudbury, 1-10.